

THE CLOSURE PROJECT WAS MANAGED WITH PROJECT MANAGEMENT PRINCIPLES. COST AND SCHEDULE VARIANCE WERE MONITORED AND REPORTED MONTHLY; THE CRITICAL PATH WAS EVALUATED CONTINUOUSLY; TECHNICAL DIRECTION WAS PROVIDED SPARINGLY; AND REQUESTS FOR EQUITABLE ADJUSTMENT WERE INFREQUENT.

INTRODUCTION

Successfully pursuing accelerated closure at Rocky Flats required the creation and implementation of a closure "project." That is, the approach for cleanup and closure of Rocky Flats needed to be described with a clearly defined start and end date, with specific project milestones, budget plans and performance criteria. Accelerated closure also required transitioning the culture of the workforce, both DOE and contractor, from production/operations to closure. Implementing the Closure Project became possible with the development and validation of an accelerated closure vision ("Proof of Concept") and an effective Closure Project Baseline.³⁹ That baseline was work-activity based and established a schedule for activity completion as well as estimating project costs. The Baseline defined the plan to execute the accelerated closure project and allowed progress to be measured. In addition, the Closure Project milestones and endpoints outlined remained fixed throughout the life of the project.

ACCELERATED CLOSURE CONCEPT
CONGRESSIONAL SUPPORT
REGULATORY FRAMEWORK
CONTRACT APPROACH

PROJECTIZATION

SAFETY INTEGRATION
SPECIAL NUCLEAR MATERIAL
DECOMMISSIONING
WASTE DISPOSITION
ENVIRONMENTAL RESTORATION
SECURITY RECONFIGURATION
TECHNOLOGY DEPLOYMENT
END STATE AND STEWARDSHIP
FEDERAL WORKFORCE
STAKEHOLDER INVOLVEMENT

The aggressive vision and relentless commitment to closure formed the foundation for an achievable project made possible by the application of project planning tools. Creating a project plan that challenged the workforce (with a previously unclear operating mission to one firmly committed to accelerate closure) required tremendous leadership and focus. Applying, and in some cases creating, the systems to accelerate closure in parallel with making organizational changes made the closure of Rocky Flats in 2005 an attainable goal. This section describes the actions and approaches to "creating and getting people to believe" in the possibility of a Rocky Flats closure project and to "delivering and making real" the closure project plan and baseline. It also addresses actions taken in executing the project to achieve the closure objectives under budget and ahead of schedule.

A strong vision and a relentless commitment to closure by senior level management were vital to creating the closure project.

DISCUSSION

Early Planning Efforts

Several key leaders within both DOE and the contractor, Kaiser-Hill (K-H), had a tremendous impact on the development of an accelerated closure project at Rocky Flats. In 1994 and early 1995 DOE's Rocky Flats Field Office (RFFO) Manager definitively stated the goal for site closure and effectively engaged community stakeholders through the development of the 1994 Rocky Flats Strategic Plan which was issued on September 19, 1994.

The 1994 Rocky Flats Strategic Plan documented the vision, goals, objectives, and success criteria for reducing, eliminating, or mitigating existing environmental liabilities, while protecting the safety of the workers and the public. The emphasis of the Plan was reducing liabilities, eliminating inefficiencies, and minimizing unnecessary work activities. The 1994 Strategic Plan was developed with extensive input from the federal and contractor workforce, DOE HQ, regulators and stakeholders. The active involvement of these various groups helped to develop a site plan that outlined the challenges facing Rocky Flats and the scope of work needing to be accomplished. During the development of the plan, it was realized that the outreach process built trust among these diverse groups and jump-started the communications necessary for all parties to understand the significant issues that needed to be resolved.

The 1994 Strategic Plan also accomplished other important tasks in that it was the first organized effort to communicate a change in the mission at Rocky Flats from nuclear weapons production to cleanup and closure. As the plan was drafted and revised through several iterations, it was shared with Rocky Flats federal and contractor employees through presentations at large group meetings and through supervisory chains of command. Employees participated in the comment process and their comments were dispositioned in the same way as regulator and stakeholder comments. Finally, the plan communicated the cleanup scope of work to prospective bidders when the Rocky Flats management contract was competed in 1995. The 1994 Strategic Plan was a part of the Request for Proposal sent out by DOE in its solicitation for a new operating contractor.

Liability Reduction Activity Teams

The Liability Reduction Activity Teams were composed of federal personnel and worked during late 1994 and early 1995. The purpose of these teams was to further define the scope of the liability reduction and mortgage reduction work that could be accomplished at Rocky Flats. The Site problems were still perceived in terms of reducing cost and liabilities of an ongoing site, not in terms of achieving closure. This was partially the result of the complexity and uncertainties associated with closure and partially due to the definition the Rocky Flats' DOE HQ Program Office role (EM-60, Transition). These teams defined preliminary performance metrics for the 1995 management contract solicitation. concentrated in the areas of stabilizing actinide solutions, consolidating Special Nuclear Material into a single facility, shrinking the Protected Area, disposing of all waste forms, including low level and transuranic wastes, disposing of excess Special Nuclear Material and classified documents, accelerating environmental clean up, and deactivating facilities. As a result of their work, the teams expanded the understanding

During the development of the plan, it was realized that the outreach process built trust among these diverse groups and jumpstarted the communications necessary for all parties to understand the significant issues that needed to be resolved.

throughout the RFFO of the scope to be accomplished in cleaning up the site and that achieving the success criteria initiated with the 1994 Strategic Plan was possible. This set the stage for acceptance of the very aggressive closure concept details developed by the new contractor in 1995 and 1996.

Baseline Environmental Management Report

At about the same time that Rocky Flats was documenting its strategic vision for eliminating environmental liabilities, cleanup and closure of the site seemed a distant dream at DOE HQ. In March 1995, the DOE issued the results of a Complex-wide analysis of the costs and schedule necessary to cleanup the Department's aging facilities. The Baseline Environmental Management Report (BEMR I)⁴ documented DOE's estimate that the cleanup of Rocky Flats would take approximately 65 years and cost over \$37 billion. The BEMR was a bottoms-up analysis that accounted for all of the activities and sequences traditionally anticipated in a DOE cleanup program. Even after receiving updated information from Rocky Flats, DOE HQ projected in BEMR II (June 1996) the final cleanup and end state closure of Rocky Flats in 2055 at a cost of \$17.2 billion.

The Interim End State Document and The Accelerated Site Action Project

K-H came on board as the Site contractor in the summer of 1995. They created a small team to explore the idea of accelerated closure and provided the senior leadership necessary to make this vision a viable effort. DOE was asked to include a participant to lend perspective and DOE awareness to this largely "black box" effort. The team, along with numerous other participants, supported the planning effort for accelerated closure, making the vision provided by senior leadership a reality. The following were significant events in the planning process.

In late August of 1995, K-H and RFFO embarked on an innovative process to define the end state of Rocky Flats and capture the course of action for accelerated closure. This effort, known as "Interim End State," envisioned an aggressive approach to cleanup of the Site and called for increased engagement of stakeholders. The process evolved into the "Accelerated Site Action Project" or ASAP and continued to set the strategic vision of accelerated closure. The plan was developed by a small group of RFFO and K-H personnel who were instructed to take a commercial approach and to question and challenge every closure assumption. While ASAP proved critical to the process of creating the idea of accelerated closure, because of its aggressive vision it was not easily received outside of the Site. Stakeholders were surprised by accelerated closure end-state assumptions that were different than previous

K-H created a small team to explore the idea of accelerated closure and provided the senior leadership necessary to make this vision a viable effort.

plans that had been discussed, and some at DOE HQ were concerned with the ability to meet the DOE commitments that were part of the plan.

By February of 1996, Phase II of the ASAP document, *Choices for Rocky Flats*, ⁹ provided stakeholders with alternative end-state choices and described the cost and schedule implications of each choice. One choice documented in ASAP II projected that closure could be accomplished at a cost of \$10 billion with completion in 2016. Subsequent ASAP documents refined the specific activities needed to implement the strategic vision for cleanup and closure, and successive iterations of closure lifecycle baselines developed in response to that vision were critical to making closure in 2006 an achievable goal.

A key aspect of baseline development and the planning process was the aggressive "top down" approach to planning. Goals to accelerate cleanup and closure were set in each of the ASAP publications and the subsequent phases of baseline development created in response. More traditional, functional "bottoms up" information was never allowed to define or limit the project. Rather, the strategic vision of accelerated closure, further clarified through the ASAP process, set the implementation plan for closure.

The "10 Year Plan"

Two significant events occurred in June and July of 1996. U.S. Department of Energy Assistant Secretary for Environmental Management directed each EM site to draft a "10 Year Plan" outlining the cleanup of their site. In doing this, EM also drove DOE complex-wide support of individual site needs for accelerated closure. A joint DOE and K-H effort (ASAP III¹⁵) led to the Rocky Flats input to the Ten Year Plan and projected closure in 2015 at a cost of \$7.5 billion. Without EM HQ direction and support, particularly involving the disposition and consolidation of waste, accelerated closure at Rocky Flats would have been more difficult, if not impossible.

The second important event in July 1996 was the signing of the Rocky Flats Cleanup Agreement (RFCA)³ (outlined in the Regulatory Framework section), which provided the regulatory structure for accelerated closure of the Site and agreed upon project milestones. One of the choices provided previously in ASAP II served as input to the end state agreed upon in the RFCA.

A key aspect of baseline development and the planning process was the aggressive "top down" approach to planning.
More traditional, functional "bottoms up" information was never allowed to define or limit the project.

Closure Project Baseline (CPB)

Following the initial development of ASAP, K-H, partnering with DOE Rocky Flats, began to build a project baseline that eventually became the basis for negotiating and administering the Closure Contract and determining potential incentive fees. The Closure Project Baseline (CPB) embodied the overall concept of the project that fueled increasing confidence that the project could be accomplished faster and cheaper. This increased confidence was both internal to K-H and DOE RFFO as well as the stakeholder community locally and in Washington, D.C.

Development of the CPB occurred between 1997 and 2000. During that dependent upon time, three major complete baselines were prepared and delivered to the DOE RFFO. The end objectives of each baseline were distinctly different. In each successive iteration, the end state was further clarified, the schedule was accelerated, the cost was reduced, and the level of detail was increased. Planning efforts mentioned earlier, such as the Interim End State and ASAP, were developed using a network of Subject Matter Experts from functional work areas and included people who were new to the Site (and thus brought a fresh commercial perspective). When the baselines were developed, each K-H organization provided a manager that was responsible for his or her organization's plan. These people evolved into the "Planning Managers" that reported directly to the Project Vice Presidents responsible for execution. This element was critical in establishing a clear line of accountability and increasing ownership of the baseline for each performing organization.

The first major CPB, completed in June of 1998, had a Closure Project end date of 2010 and a total cost of around \$8B. The CPB consisted of an eleven-level Work Breakdown Structure (WBS) and almost thirty Project Baseline Summaries (major subprojects). In time, this proved to be an overly cumbersome system with far too much detail for lines of authority and establishing logic ties. By 1998 the K-H organization was "functionally" organized with major subcontractors assigned functional scope (i.e., nuclear operations, environmental restoration, waste management infrastructure, security) and executing assignments in numerous buildings. However, there were no clear lines of authority or accountability for overall closure efforts. This complicated planning substantially and led to a number of internal conflicts, often between subcontractors, regarding cost estimates and staffing levels. Waterhouse Coopers (PWC) independently reviewed the 2010 CPB. This review (and others subsequently performed) is described in more detail in the External Credibility Reviews segment of this section.

Development of a credible baseline was essential. To implement the baseline, Rocky Flats was complex-wide support from DOE to allow delivery of GFS&I and completion of project milestones.

5-6

One problem that the CPB highlighted was that much of the Site budget was consumed by "landlord" costs – costs just to keep the buildings open. These included not only costs for utilities, but also costs for surveillance and maintenance, maintaining the authorization basis, and services from program or support organizations. Additional budget was consumed by costs to meet compliance requirements - Defense Board and regulatory milestones. Only a small portion of the annual budget was "discretionary." As dialogue continued with the regulators and the public, there came to be a general agreement to initially focus "discretionary" funding on the activities that would eliminate the higher nuclear risk problems at the expense of decommissioning and environmental restoration. Over the next year, in parallel with the dialogue, the Site planning and integration organization substantially increased the level of detail and number of activities, leading to finer resolution of the prioritization process.

Aligning DOE and K-H was a major element necessary to assuring success in achieving closure in 2006.

2006 Closure Goal

The CPB prepared in 1998 helped to solidify the creation of the idea that an accelerated closure project was possible. Success in development of the 2010 closure baseline led to a second more aggressive effort in 1999 focused on achieving 2006 closure. This effort was a major goal of the senior K-H and Rocky Flats Site Managers. In addition, they recognized that to make accelerated closure happen they would need to build a strong partnership between their two organizations. Aligning DOE and K-H was a major element necessary to assuring success in achieving closure in 2006. With both the government and contractor working in the same direction, the Closure Project improved its ability to refine the accelerated closure schedule and to "lock in" an achievable closure target. In addition to monitoring the development of the 2006 CPB, the senior management group devoted a substantial amount of time to resolution of major strategic issues, such as plutonium residue processing, waste disposal paths, and D&D methodology. Dealing with these issues at a high level focused the organizations on achieving 2006 project completion. As employees saw senior management focused on finding a way to achieve 2006, buy-in at the staff level began to grow.

It must be remembered that, despite the detailed planing being conducted by RFFO and K-H, at the time there was widespread skepticism that the 2006 goal of closure could be accomplished. The larger Site saw only incremental change in day-to-day activities. The General Accounting Office issued a report in 1999⁵¹ calling the goal "laudable" but unlikely (followed by a second report in 2001⁵² again suggesting that closure as soon as 2006 was unlikely).

Closure Project Baseline, Revision 3

Building on the planning efforts developed through partnership with DOE, K-H, in June of 1999, delivered the CPB Revision 3.⁵³ This CPB had a completion date of December 2006 and a total cost of \$6.7 billion. Many of the earlier issues regarding residues, SNM packaging, and waste disposal paths had been resolved. Level-of-effort department staffing plans within the contractor organization had been dramatically cut and individual organizations felt "ownership" of both the approach and the schedule.

The development of CPB Revision 3 solidified the management approach of earlier planning efforts into a final form. Based on the then-current CPB and the direction provided by senior management, "cases" were developed which postulated accelerated project performance (cost and schedule). These cases were based on assumptions that had surfaced during senior management strategy sessions. The K-H Planning Team, comprised of one representative from each organization, along with members of the Planning and Integration organization, came to consensus on the assumptions and work logic. That consensus result became the "top-down" plan. Each organization was then charged to develop a detailed plan that complied with and implemented the top-down work logic, cost and schedule targets. The "bottoms-up" detailed plans did not easily achieve the cost and schedule constraints of the top-down targets. The K-H Planning Team continued to work new issues iteratively, trying in each successive attempt to reduce cost and improve schedule. In hindsight, it is interesting to note that, as a result of the management leadership driving the project, the final cost of the project in 2005 proved to be closer to the "top down" case developed in 1999 than the "bottoms up" cases.

Basis of Estimate Software Tool

One major contributor to the success of the CPB effort was the development of a <u>centralized cost estimating system known as BEST</u> (Basis of Estimate Software Tool).⁵⁴ This system ensured that estimates were consistent from organization to organization, that they met the fundamental criteria necessary for external validation, and that all estimates "rolled-up" consistently from the lowest level to the overall plan. This system was expanded to include scope such as waste volumes by type, commodity projections, as well as craft labor and support dollars.

The Site came to consensus on the assumptions and work logic that became the "top-down" plan. Each K-H organization then developed a detailed "bottoms-up" plan that complied with the top-down work logic, cost and schedule targets. The K-H Planning Team continued to work new issues iteratively, trying in each successive attempt to reduce cost and *improve* schedule

IMPLEMENTING THE CLOSURE PROJECT

"Level Funding Profile"

Following the completion of Revision 3 of the CPB, it became clear that another major revision was needed. Up until that point in time, the overall project cost profile had been developed in accordance with standard project management techniques. However, as part of the Congressionally mandated funding profile, DOE made it clear that a "level" funding profile of \$657 million per year would be allocated for the Closure Project. Total project funding requirements were very close between the CPB Revision 3 and the DOE planning levels, but the level, annual funding allocation presented a new challenge that needed to be addressed in the baseline. Funding profile issues became a major part of the negotiation of the DOE Closure Contract with K-H in 2000.

A disciplined application of project management fundamentals enabled projectization.

Closure Contract CPB (Rev 5)

In June 2000, the Closure Contract CPB (Rev 5)³⁹ was developed to resolve a number of issues related to Closure Project funding and organization. This CPB was delivered to the DOE on June 30, 2000, as a requirement of the newly signed Closure Contract, and was validated early the following year.

The major features of this revised CPB included:

- Lowered cost (in line with the annual DOE funding target)
- Streamlined WBS system (Four reporting levels. Individual Execution Projects could extend the WBS to whatever levels/charge numbers necessary for their internal controls.)
- Correlation of the WBS to the Organization Breakdown Structure (OBS)
- Clearer role for subcontractors in the overall Closure Project structure
- Internal cost and schedule contingency created and reserved by K-H (working plan versus CPB)
- Earned Value Milestones that tie the CPB to fee calculations
- Incorporation of all scope and resources (such as analytical samples, commodities, and waste volumes)
- Improvements to charging practices associated with the revised WBS

Again, this baseline was produced using the "top-down, bottoms-up" iterative approach and resulted form an intense effort for several months by all organizations. During the same time period, K-H codified its project control system (as required by the contract) into a <u>Project Control System Description (PCSD).</u> 54

With the experience and knowledge of the K-H planning managers now resident in the Execution Projects, the PCSD in place, and a strong partnership between the government and contractor, project performance was improved consistent with the revised schedules. In the cost arena, schedule acceleration proved to be the most powerful weapon. Enormous amounts of "level of effort" funding were deleted for each year and subsequently eliminated from the schedule. The most critical element of the entire effort, however, was the consistent, tenacious focus of the K-H CEO and Rocky Flats Manager on overall Closure Project performance. Winning over "believers" in accelerated closure came from the "trickle down" of intense senior management focus on achieving this objective.

Closure Project Organization

One of K-H's first post-contract award activities in 2000 was to reorganize from a "program" organization based on functions and its Performance Based Integrating Management Contract (PBIMC) subcontractors into six Execution "Projects." The Execution Projects consisted of the four plutonium buildings (771 Project, 776 Project, 707 Project, and 371 Project); another Execution Project for all other facility decommissioning, environmental restoration, and infrastructure; and a final Execution Project containing waste management, security, and stabilization. Several other support organizations were responsible for business processes, planning and project reporting, engineering and safety oversight, regulatory compliance, construction support, etc. However, the reorganization assigned the responsibility and authority for almost all activities necessary for execution to the Projects and promoted the Project Managers to Vice Presidents. It divided program organizations such as engineering, safety support, procurement, project control, and similar functions and assigned individuals to the respective Execution Project organization. With the relocation of plutonium stabilization operations so that all such non-decommissioning plutonium activities were in Building 371 (see the section on Security Reconfiguration), the remaining plutonium building Projects were not distracted by an operating mission and were able to completely focus on the decommissioning of their facility.

The subcontracting and staffing approaches were completely reorganized as well. All execution, previously the scope of the major subcontractors, became direct K-H scope. K-H contracted directly with most of the "third-tier" subcontractors, shortening the procurement chain and centralizing the procurement process. K-H also substantially increased its staff, offering positions principally to existing employees of lower-tier subcontractors, although several key managers and staff were hired from

The reorganization assigned the responsibility and authority for almost all activities necessary for execution to the Projects, and promoted the Project Managers to Vice Presidents.

outside the Site. The principal remaining subcontractor scope became to provide non-K-H labor. Major subcontractor business functions, previously direct contract costs, became their overhead costs. All of these changes streamlined the ability to manage resources and costs, allowed flexibility of compensation, and reallocated and reduced Site staff.

Commercial Contracting

One element of the Closure Contract management strategy involved the deployment and control of commercial contractors to support decommissioning, remediation, and construction work. Contracting was required to provide additional resources, management flexibility, and to address Davis-Bacon requirements. The initial concept was that the Site bargaining unit employees (United Steelworkers of America) comprised a limited number of skilled resources that would perform the decommissioning of the more contaminated process systems. additional labor for accelerated closure and demolition would be provided by the construction crafts ("Building Trades") under a fixed-price subcontracting approach. The Building Trades would be deployed as early as funding became available, in some cases in the same building as Steelworkers, to support the acceleration of Projects. Additional fixed price procurements would occur for environmental restoration and other elements of defined scope. Considerable effort went into looking at ways to reduce DOE or Site-specific requirements for this less-hazardous work Commercial to make it more like normal commercial construction. One specific example was the decommissioning of Building 111, a 1950's vintage office building, that was used to pilot the use of commercial requirements on-Site.

While the Site had some success in reducing unnecessary requirements, there were several problems with the all-fixed price approach. The first was that some activities could not be sufficiently well defined as to the existing conditions and the interaction with existing Site organizations to support a fixed-price approach. A second was the prolonged ramp-up incidents experienced by some of the subcontractors that were used in the initial Building Trades decommissioning work. Finally, there were safety performance issues, where trends of minor accidents and incidents caused shutdowns, and subcontractor work control programs did not support the necessary corrective actions. The overall result was a drop-off of schedule performance that was remedied by modifying the subcontracting Several subcontracting approaches were used, such as a "captive" construction subcontractor, a major functional subcontractor for decommissioning scope, contracting with subcontractors familiar with DOE work, and more active oversight of subcontractors by K-H. All of these remedies resulted in construction subcontractor management being actions.

Commercial subcontractors had problems with safety performance issues, where trends of minor accidents and incidents caused shutdowns, and subcontractor work control programs did not support the necessary corrective actions

more familiar with Site safety and performance expectations. Regardless of these problems, the experience in developing commercial-type statements of work for non-nuclear facilities resulted in a better ability to tailor Site requirements to the risks posed by commercial-type work.

Reporting Structures for DOE-HQ

As part of the commercial approach to the Closure Project, the Site attempted to convince DOE-HQ that the closure effort was a single DOE project and should be planned, formulated, managed, tracked and reported as a single project. Due to DOE-HQ concerns with justifying a single \$600+ million annual project to Congress and, at the time, the traditional "stove-piped" program (not project) management at DOE-HQ, the Site was initially required to plan, formulate, track and report as 30 individual projects (not aligned with Site Execution Projects). Since the Site chose to manage closure as a single project (not 30 individual projects), reporting along DOE-HQ formats became a "paper chase" outside of the normal project management functions. Given the Site's focus on eliminating activities that did not directly support cleanup and closure, considerable effort was directed to obtaining relief from unnecessary reporting Over time, reporting requirements were more closely requirements. aligned to the CPB and with the Closure Project management strategy, allowing changes to be made and risks to be managed consistently while accomplishing safe closure in the fastest, most cost effective way possible.

External Credibility Reviews

The flexibility provided by the Closure Contract depended upon DOE (and Congress) accepting of the validity or the Contract CPB Revision 5. DOE needed to believe that the estimate elements represent the best information available and had not been manipulated to be unachievably low or padded to assure contractor success. The fact that the CPB was credible was important to permit multi-year funding authorization and progress payment based on earned value, and in eliminating the previous method of DOE using milestones and performance measures to control K-H. Thus the DOE was able to allow K-H wide latitude to manage activity scope, approach, and schedule trusting in the robustness of the CPB to both minimize inappropriate manipulation and provide transparency for Closure Project oversight.

As the accelerated Closure Project scope was being refined and K-H was developing schedules and cost estimates, the contractor and DOE embarked on a series of external credibility reviews. Recognized experts in the field of project management and large accounting firms conducted the reviews. These reviews were intended to help the Site identify soft

External
credibility
reviews of the
Closure Project
Baselines were
used to build
confidence both
internally and
with HQ and
Congress, and to
provide objective
recommendations
for project
improvement.

spots in project scope, schedule and cost in the short-term, while in the long-term to establish credibility both internally and externally to the Site. The Site approached each of these reviews in a positive manner, so that maximum benefit could be gained for the time invested in each review.

In February 1997, the U.S. Army Corps of Engineers (USACE) conducted an independent assessment of the remediation baselines at 13 DOE Environmental Management sites around the country. This assessment was performed at the request of the DOE. The assessment consisted of a review of the existing cost estimates, technical scopes, schedules and supporting data underpinning the baselines. The results of the review emphasized the need to spend more time developing quality cost estimates. Additionally, this review set the stage for Rocky Flats to continue with external reviews of proposed CPBs submitted by the contractor.

In July of 1998, Price Waterhouse Coopers (PWC) reviewed²¹¹ the Rocky Flats CPB for compliance with the PMI Project Management Body of Knowledge and a variety of project management textbooks. Specifically this was a review of the first major baseline, completed in June of 1998, with a projected end date of 2010. K-H contracted with PWC to perform the independent validation. In September 1999, Ernst & Young, LLP (E&Y) completed a reasonableness review²¹² of the cost, scope and schedule projections in the CPB Revision 3. DOE contracted with E&Y to perform the review between June 1999 and August 1999. Finally the Closure Contract Project Baseline Revision 5 was reviewed by Burns and Roe with more of an operations focus to the analysis.²¹³

These credibility reviews were not performed in place of reviews by the contractor and the DOE, but supplemented the reviews conducted internally by the Site. The end result of this arduous scope, schedule, and cost development, with repeated independent reviews by recognized experts, was a willingness of the DOE and K-H to enter into a long-term closure contract with a fixed target cost and very high change control thresholds, based on the confidence in the Closure Project Baseline. In addition, the results of the reviews provided additional confidence on the part of the regulators and high level stakeholders (e.g., Congress, DOE-HQ) that the Closure Project, as planned, could succeed.

High Change Control Thresholds

The Rocky Flats Closure Contract signed in January 2000 defined the Site's end state, project target cost and schedule. The effective working relationship between RFFO and the contractor, and the confidence in the baseline with its project scope, schedule and costs well-defined, enabled

....variance tracking was accomplished on a project life cycle basis, rather than a fiscal year basis.

the government to write high change control thresholds into the contract. This also represented a high level of trust on the part of DOE with the K-H planning process and the contractor ability to deliver. The change control thresholds were:

- greater than a \$40 million change, DOE-HQ approval
- greater than a \$20 million change, local RFFO approval
- less than a \$20 million change, contractor approval

It is important to note that these were not changes to the baseline target cost and schedule, but changes that allowed flexibility in work sequencing between or within sub-elements of the total Closure Project. The benefit to the contractor of these high change thresholds was that the contractor was able, for elements of the project within the baseline, to respond to new ideas, cost savings, cost overruns, and other challenges quickly, instead of waiting 2-6 weeks for DOE approval. The advantage to the government was that the baseline was not being reset at the start of every fiscal year; variance tracking was accomplished on a project life cycle basis, rather than a fiscal year basis. Both parties benefited in that the number of change proposals being processed dropped by an order of magnitude since these high thresholds were implemented. Additionally, the CPB was being used to measure performance towards the closure goal of December 2006, at a target cost of \$3.963 billion. By mutual agreement between the contractor and DOE Rocky Flats, changes to the baseline itself were only made when the scope of the contract was also changed through the equitable adjustment ("REA") requirements in the closure contract.

Project Control System

The Project Control System (PCS) was one of only two items (along with the Predetermined Work Activities Matrix) explicitly approved by the DOE Contracting Officer upon implementing the closure contract. The contractor built the CPB, the cost estimates and the logic-tied Primavera Project Planner (P3) schedule at exactly the same activity level. The scope statements, cost estimates and P3 schedule information were contained in the contractor's PCS. The contractor submitted a description of this PCS to RFFO for approval 60 days after the contract became effective.

Some of the objectives of the PCS were to:

- Establish and maintain a project cost, schedule and technical baseline within the framework of the closure contract requirements
- Develop and publish timely project management reports that display technical, cost, schedule and funding status based on the approved CPB

DOE direct
access to the
PCS also
increased the
level of DOE
awareness and
trust since DOE
staff had direct
and immediate
access to the KH project status
and planning
information.

- Measure actual and forecasted cost and schedule status against the CPB to determine actual and projected performance
- Maintain a concise and documented change control process for the CPB
- Plan, report, and execute all at the same level of the Work Breakdown Structure

RFFO performed a comprehensive and detailed assessment of the contractor's implementation of this Project Control System Description prior to approving the system. In July of every year K-H provided DOE with an Annual Update, in which it formally projected and documented any changes, although in practice few were made.

The contractor gave full and unfettered PCS access to the RFFO staff. This enabled the RFFO to download project information for direct analysis and left the contractor to the business of day-to-day project management. This downloaded information was used by DOE staff to directly produce monthly and quarterly project reports for use by contracting officials, stakeholders, regulators and DOE HQ, eliminating the need for additional support from the contractor. It also increased the level of DOE awareness and trust since DOE staff had direct and immediate access to the K-H project status and planning information.

Predetermined Work Activities (PWA)

The other document explicitly approved by the DOE Contracting Officer was the PWA Matrix. This matrix described approximately 900 "real closure work" activities taken directly from the CPB with a value of \$1.14 Billion, the completion date for each activity, and budgeted cost. The entire matrix was under change control of RFFO and any changes submitted by the contractor were subject to a high level of scrutiny with a zero change threshold. The matrix as originally approved represented the best link to the original Closure Project Baseline developed by the contractor. Maintaining this link between the PWA Matrix and the original Closure Project Baseline led to a high confidence level that the contractor's performance would meet or exceed the level originally thought necessary to achieve the goals of the closure contract.

Quarterly, DOE Rocky Flats calculated schedule variance from the approved PWA Matrix by performing a 100% physical validation of the work reported complete by the contractor. Disagreements were avoided because the scope of each activity in the PWA Matrix was for 100% completion (unless a quantitative measure such as residues stabilized or waste disposed) before any earned value credit was given for the activity. Waste disposed from decommissioning (as opposed to legacy waste

Maintaining this link between the PWA Matrix and the original Closure Project Baseline led to a high confidence level that the contractor's performance would meet or exceed the level originally thought necessary to achieve the goals of the closure contract.

processed) <u>turned out to be a poor project metric</u>, because the actual waste generation was often different (and usually larger) that that originally estimated. Thus, the full earned value of the activity might be realized while additional waste remained to be generated. The total PWA earned value reported compared to that scheduled to be complete provided contracting officials with valuable information as to how much progress had been made towards a 2006 closure date.

In addition to contracting officials using the PWA Matrix in determining progress towards 2006 closure, the Site's regulators used this same matrix to establish earned value milestones in the regulatory arena. For more information regarding the tie between the PWA Matrix and the regulatory milestones, see the Regulatory Framework section.

Closure Contract Project Baseline as a Useful Management Tool

The Baseline was an effective project optimization tool, providing high quality project data to support informed decisions, allowing continual optimization to take advantage of opportunities and reflecting the impact of changes in execution methods. K-H created and maintained three Primavera schedules: the contract baseline schedule, a working baseline schedule, and the "2 TO GO" schedule. The baseline schedule contained 12,786 total activities. The working and "2 TO GO" schedules, derived from baseline data and incorporating the latest activity durations and logic, were used to project impacts of activity delays and accelerations, allowing active project management, coordinating activities between Execution Projects and identifying options for closure schedule acceleration. It was also used as a communication tool between K-H and DOE, ensuring that Government Furnished Services and Items (GFS&I) activities and K-H Closure Project activities supported each other (e.g., that GFS&I trucks are available to remove packaged special nuclear material). The result was better allocation of funding to critical and near-critical activities and significant overall Closure Project acceleration.

The baseline did not include the detailed-planning level data – it provided activity scope, cost, and duration but only generally discussed how the work would be accomplished. The detailed planning resided in the work control documents and procurement documents that controlled work execution. This "rolling wave" detailed planning of near term activities avoided unnecessary complexity at the Closure Project level and unnecessary planning far in advance of the work, and allowed feedback and flexibility to adjust forecasts in the higher-level schedules.

The project schedules were used to project impacts of activity delays and accelerations, allowing active project management, coordinating activities between Execution Projects and identifying options for closure schedule acceleration.

Project Risk Management

The effort to define the baseline included the definition of project risk. Baseline activities were assigned risk values based on an assessment of parameters such as how well the work was defined and whether methods were in place to accomplish it. The risks were compiled at the Execution Project level and were managed using contingency and internal change control. The Monte Carlo simulation was used to mitigate schedule and cost risk by focusing on those activities that had substantial influence on the outcome. K-H prepared quarterly risk analyses of the contract baseline. The risk analysis generated optimistic and pessimistic cost and schedule data for each activity. The results identified the "90% confidence level" expected completion date and cost at completion. Risk Management practices were incorporated into everyday project management with Rocky Flats personnel conducting risk management activities as part of their monthly meeting and reporting. Typical reports included discussion of critical path or near critical path items and issues or potential issues that could affect Closure Project completion. Schedules were checked and updated to red-yellow-green status and corrective actions identified. 57

The Monte Carlo simulation was used to mitigate schedule and cost risk by focusing on those activities that had substantial influence on the outcome.

Project Reporting

K-H provided monthly project reporting to the RFFO. Cumulative cost and schedule variances were identified, causes for the variances were explained, and trends and performance indices were compared to the contract schedule, the working plan, and the "2 To GO" plan. Physical accomplishments for the month were identified, and the critical path was reviewed. The status of demolition milestones was updated with trending information, external support needed to complete the Closure Project was discussed, documents submitted to RFFO for approval were identified, and a summary of issues was explained.

K-H also produced a quarterly critical analysis report for the total Closure Project and by individual Execution Project. The report addressed key accomplishments, risks, near-term objectives, performance indices, issues, and recovery items. It also included Request for Equitable Adjustment status, external project issues, critical path performance and float analysis, DOE and regulatory milestones issues, estimated cost at completion, funding status, and an analysis of the critical staffing skills.

Sunset Project

In 2002, the RFFO began developing the "Sunset Project" to document all Federal activities necessary to close the Site and to transition continuing functions to Office of Legacy Management (LM), the U.S. Fish and

Wildlife Service, or the Consolidated Business Center. (LM became the ultimate responsible DOE entity for the industrial portion of the Site and the U.S. Fish and Wildlife Service will assume management responsibility for the buffer area.) The Sunset Project recognized that K-H had a specific scope to complete under contract for site demolition and remediation, but there were many uniquely DOE tasks that needed to be accomplished to complete the overall site closure. The "Sunset Project" was supported by a Primavera schedule that outlined over 1000 activities assigned to individual Federal staff members. The schedule status was reported each month and included a 60 day look ahead for upcoming activities. GFS&I were tracked by the responsible DOE individual and by the headquarters point of contact when identified. Spreadsheets were generated with upcoming GFS&I identified by quarter and included notations as to whether dates need to be moved forward or back based on the contractor's updated schedule.

The primary value of the Sunset Project was to maintain the focus of the DOE on completion of the total mission and to ensure that hundreds of seemingly minor tasks did not inadvertently get ignored. The Sunset Project also served to be invaluable for capturing institutional knowledge as the DOE staff went through significant downsizing and loss of personnel and to reassign responsibility when staff departed.

Projectization

It is a management axiom that a clear project scope and having responsibilities and authority vested with a single project manager are two key components for project success. The decision to divide the Closure Project organization into six Execution Projects, five of which had the scope of removing their specific facilities to ground, was extremely successful. The decision on whether a Site function or organization is required is reduced to whether or not an Execution Project Manager will pay for it. This resulted in individuals and organizations identifying ways to achieve the common goal – removing facilities. The Execution Projects were of appropriate size to allow sufficient project manager focus, with minimum "collateral" responsibilities. The area or facility-specific approach avoids the ambiguity of whether a problem is the responsibility of the "program" or the "landlord."

An unanticipated result of the projectization was a healthy competition between Execution Projects. There were initial concerns that splitting up previous "program" functions, such as engineering, would reduce overall Site efficiency. The actual result has been several organizations "reinventing the wheel", iteratively building upon each other's innovations with positive results. A specific example was the decontamination of gloveboxes from transuranic to low-level waste. This method of glovebox

One result has been several organizations "re-inventing the wheel", iteratively building upon each other's innovations with positive results.

removal was pushed aggressively by the 776 Project; as the success became apparent, other Projects incorporated the technology, and continued to refine the decontamination and removal processes. Structuring personal incentives based on a common goal – Site closure - encouraged the sharing of resources and capabilities and discouraged the Closure Project competition from becoming "unhealthy."

Encouraging management focus on actions in its area of Site closure responsibility extended to the DOE activities. The Closure Contract clearly defined DOE direct responsibilities for actions to achieve closure, including the disposition of special nuclear materials and wastes (once K-H had packaged them) and final Closure standards. Some of the disposition activities required interaction with other sites and DOE headquarters to assure timely support. RFFO was also responsible for the budget development, submittal, and interaction. This was not reviewing a budget prepared by the contractor, but development of budget documents "from scratch" based on CPB and working schedule data. This division of labor reduced contractor focus on non-execution activities. DOE reorganized its internal responsibilities to provide direct K-H interfaces within RFFO and minimize direct headquarters-to-contractor contacts. RFFO's organization facilitated the GFS&I mission by vesting responsibility for those activities in the RFFO Project office and regulatory interface in the Environment and Stewardship office. The Finance organization was responsible for budget reporting and the Safety organization was responsible for Safety compliance and the Facility Representative program.

Aggressive Elimination of Unnecessary Tasks, Staff, and Costs

The Closure Contract was based on the contractor's ability to significantly improve productivity from the Site conditions that existed at the beginning of 2000. One of the keys was to identify and eliminate or reduce "unneeded" tasks and specialties and the mostly labor costs associated with them. There were several ways this was accomplished.

Aligning the work scope into Execution Projects accentuated the differences between closure-critical resources and functions that were "nice to have." This scrubbing of tasks was a continual process in a project environment, since activities were always being completed and the associated resources needed to be reallocated or eliminated. The Execution Projects' staffing of their teams became somewhat of a musical chairs process that encouraged individuals to demonstrate their capabilities. In some cases the Projects selected the individuals that they wanted from the completed activities or program organizations. In other cases whole groups were initially rolled under a Project and incoming managers then evaluated their needs and laid-off staff as appropriate.

This scrubbing of tasks was a continual process in a project environment, since activities were always being completed and the associated resources needed to be reallocated or eliminated.

K-H also aggressively pressed their subcontractors to reduce their overhead rates, reducing labor rates for staff hours while ensuring the maintenance of staff salaries. K-H recognized that a subcontractor industry had grown up around the Site with many subcontractor employees having a greater affiliation with the Rocky Flats Site than for a particular subcontractor. Thus a "performance contractor" overhead rate (indicative of project management risks and/or responsibilities) was being paid for "job shop contractor" levels of responsibility (i.e., staffing functions with little risk). In some cases subcontracts were eliminated with the general result of the staff gaining employment with a subcontractor that remained. This resulted in reduced overall labor costs for the same effort and often the same workers.

Finally, there was an aggressive effort to reduce infrastructure costs, either physical (such as in heating and electricity for offices) or for required support (such as the office staff required to maintain a Site security posture). Certain activities such as moving support staff to offsite offices allowed the reduction of central heating and accelerated decommissioning of unneeded facilities. Other actions were the outsourcing of activities such as laboratory services and the off-site treatment of mixed wastes. While these actions may have appeared to have higher costs for the specific service, they made unnecessary areas of infrastructure more visible and thus easier to eliminate, saving cost and usually time at the total project level.

During the initial Closure Project stages it was recognized that as closure activities progressed there would be a lessening of support costs; e.g. after a building had been emptied of special nuclear material, the security costs would greatly decrease. These cost reductions were almost always the result of both the direct cost reductions due to the completion of a mission activity and a conscious effort to eliminate or reallocate the staff and other resources that supported the mission activity. At the beginning of the Closure Project the overall schedule was funding constrained. This led to an active review of activities that could be accelerated to achieve a long-Thus, in addition to an activity's risk, if term reduction in costs. accomplishing the activity would free budget that could be used for closure then the activity became a higher priority. The term "Money Critical Path" was applied to this concept. A specific example was the reconfiguration of the Protected Area, which allowed earlier elimination of some high cost security tasks, thus releasing the funds for other closure activities.

While these actions may appear to have higher costs for the specific service, they have made unnecessary areas of infrastructure more visible and thus easier to eliminate. saving cost and usually time at the total project level.

KEY SUCCESS FACTORS

A number of critical elements contributed to the success of projectization of accelerated closure at Rocky Flats. Looking at the leadership and management skills necessary to drive the Site to closure, as well as the application of systems enabling project implementation, reveals several key areas of focus. These success factors include:

- 1. A strong vision and a relentless commitment to closure by senior level management were vital to creating and implementing the closure project.
- 2. Rocky Flats was dependent upon complex-wide support from DOE to allow delivery of GFS&I and completion of project milestones. Defined roles and responsibilities among both DOE and contractor organizations allowed each to contribute to Closure Project success.
- 3. Disciplined application of project management fundamentals must be used to projectize closure, but tailored to support and align with the contract and regulatory documents. Proper tailoring can allow project control systems to become a project enabler rather than just a change control and reporting tool.
- 4. Creation and utilization of planning systems and controls for project implementation facilitated performance, measurement, and communication of project progress. Planning allowed a proactive regulatory and public outreach approach, and thus minimized regulatory shutdowns, e.g., for decision document approval.
- 5. External credibility reviews of the Closure Project Baselines were used to build credibility both internal and external to the Site and to provide objective recommendations for project improvement. A credible baseline allowed DOE control without direct involvement in Closure execution. Without a credible baseline, PWAs would not be an effective tool. (Planning and decision "maturity" in 1995 could not have supported a credible baseline.)
- 6. Closure Project lifecycle instead of annual funding allows multipleyear project optimization. Project control systems and change control tools must allow the contractor the flexibility to achieve the optimization.
- 7. Providing DOE staff direct access to contractor data, such as desktop accessibility to the baseline database, both permits and encourages the DOE staff to be more knowledgeable about the project status and

issues in real time. DOE staff had similar levels of project awareness and knowledge as their contractor counterparts, which facilitated DOE's ability to engage in productive discussions on risks and alternatives.

- 8. Incentives, both for the contractor management and employees, must be correctly applied to promote Closure Project acceleration.
- 9. A safety penalty assures the contractor is proactive. In addition to the contractual safety penalties, an additional "penalty" in a schedule-incentive contract results from the downtime and schedule slip associated with resolving safety-related issues.
- 10. Subcontracting has been used to manage resources, allow flexibility of compensation, and reduce costs. Subcontracting ramp-up must be evaluated for safety and schedule impacts.
- 11. Pilot projects were useful to get work going and accelerate decision-making on Site-wide issues. Once work starts the "what-ifs" go away.

All of these factors aligned to make the accelerated closure of Rocky Flats in 2006 a credible project. However, the process of creating the idea and implementing the project was not straightforward or easy. A visionary leadership team, combined with a progressive planning process, laid the foundation for the development of an achievable Closure Project Baseline that required considerable re-working and validation. Credibility was built between DOE, K-H and a wide variety of stakeholders as project milestones were consistently met. Creating and implementing a project for the closure of Rocky Flats and defining the schedule sequencing and resource requirements necessary to achieve closure was a critical component for successfully accomplishing accelerated Site closure by 2005.

REFERENCES

Citation	Ref.
	No.
Rocky Flats Strategic Plan, Department of Energy Rocky Flats Field Office,	<u>1</u>
September 1994	
FINAL Rocky Flats Cleanup Agreement, July 1996	<u>3</u>
Estimating the Cold War Mortgage, The 1995 Baseline Environmental	4
Management Report (BEMR), March 1995	
Interim End State Plan Task Descriptions, September 1995.	<u>7</u>
Rocky Flats Environmental Technology Site Draft ACCELERATED SITE	8
ACTION PROJECT, October 1995.	
Phase II - Choices for Rocky Flats, Accelerated Site Action Project, Draft	9
Revision 1, February 1996.	
Accelerating Cleanup: Focus on 2006 ("Ten Year Plan"), June 1997.	<u>15</u>
10 Year Plan, Rocky Flats Environmental Technology Site, Draft Version 1.0, July	<u> 16</u>
<u>1996.</u>	
Rocky Flats Environmental Technology Site Closure Project Baseline, Revision 5,	39
July 2000.	
EV/SV MASTER MATRIX.	41
DEPARTMENT OF ENERGY Accelerated Closure of Rocky Flats: Status and	51
Obstacles, April 1999, GAO/RCED-99-100.	
NUCLEAR CLEANUP Progress Made at Rocky Flats, but Closure by 2006 Is	<u>52</u>
Unlikely and Costs May Increase, February 2001, GAO-01-284.	
Rocky Flats Environmental Technology Site Closure Project Baseline, Revision 3,	53
1999.	
Project Control System Description, March 2000.	<u>54</u>
Rocky Flats Baseline Performance Review Report, June 2005, Appendix A, LL -	<u>55</u>
11 Cost savings and improved performance by consolidating Procurement	
systems.	
Rocky Flats Baseline Performance Review Report, June 2005, Appendix A, LL -	<u>56</u>
12 Waste Generation rates are Poor Project metric.	
Rocky Flats Baseline Performance Review Report, June 2005, Appendix A, LL -	57
07 Broader Interpretation of Risk Management Needed.	
Rocky Flats Environmental Technology Site 2010 Closure Project Baseline	211
Validation Final Report, PriceWaterhouseCoopers, July 1999.	
Baseline Confidence Review, 2006 Rocky Flats Closure Project Plan, U. S.	212
Department of Energy Rocky Flats Field Office, Ernst&Young LLP, September	
1999.	
External Independent Review (E.I.R.) of the Rocky Flats Integrated Closure	213
Project Baseline (ICPB), June 2001.	